Mechanic's Tips

HT, HTB, CLT, CLBT 700 Series Electronic Control Transmissions

MT1958EN

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Mechanic's Tips

Allison Transmission

HT, HTB, CLT, CLBT 700 Series

Allison Transmission
Division of General Motors Corporation
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WARNINGS, CAUTIONS, AND NOTES

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions described in this handbook. It is, however, important to understand that these warnings and cautions are not exhaustive. Allison Transmission could not possibly know, evaluate, and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, Allison Transmission has not undertaken any such broad evaluation. Accordingly, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY ALLISON TRANSMISSION MUST first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service methods selected.

Proper service and repair is important to the safe, reliable operation of the equipment. The service procedures recommended by Allison Transmission and described in this handbook are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

Three types of headings are used in this manual to attract your attention. These warnings and cautions advise of specific methods or actions that can result in personal injury, damage to the equipment, or cause the equipment to become unsafe.

WARNING: A warning is used when an operating procedure, practice, etc., if not correctly followed, could result in personal injury or loss of life.

CAUTION: A caution is used when an operating procedure, practice, etc., if not strictly observed, could result in damage to or destruction of equipment.

NOTE:
A note is used when an operating procedure, practice, etc., is essential to highlight.

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PREFACE

This handbook is a mechanic's reference for removing, installing, and maintaining the HT, HTB, CL(B)T 700 Commercial Electronic Control Series Automatic Transmissions. All features of the transmission and vehicle involved in installation procedures are discussed. The information presented will help the mechanic to remove, install, and maintain the transmission in a manner that assures satisfactory operation and long service life. For additional detailed information, refer to HT, HTB 700 Electronic Control Series Service Manual SM2004EN or CL(B)T 700 Series Service Manual SM1314EN and CL(B)T 755 Electronic Control Series Service Manual Supplement SM1992EN. Troubleshooting the electronic control system is presented in Troubleshooting Manual TS2712EN.

TRADEMARKS USED

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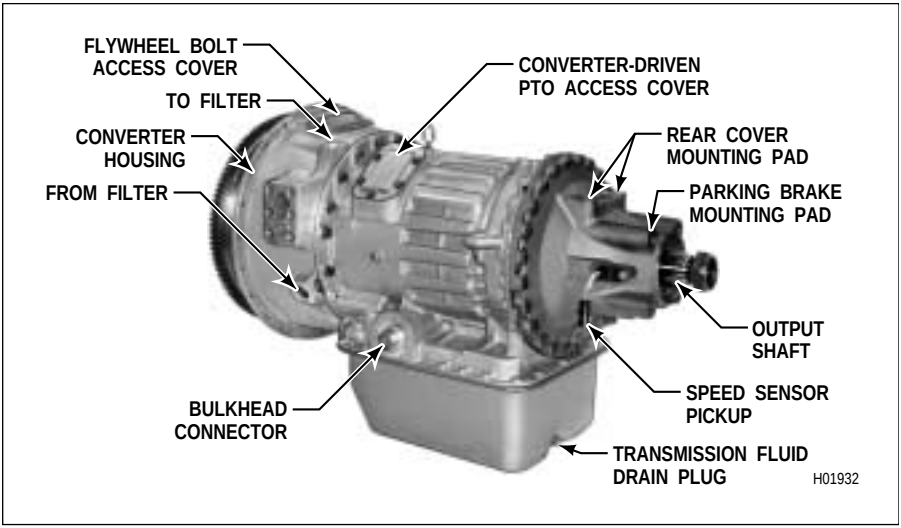
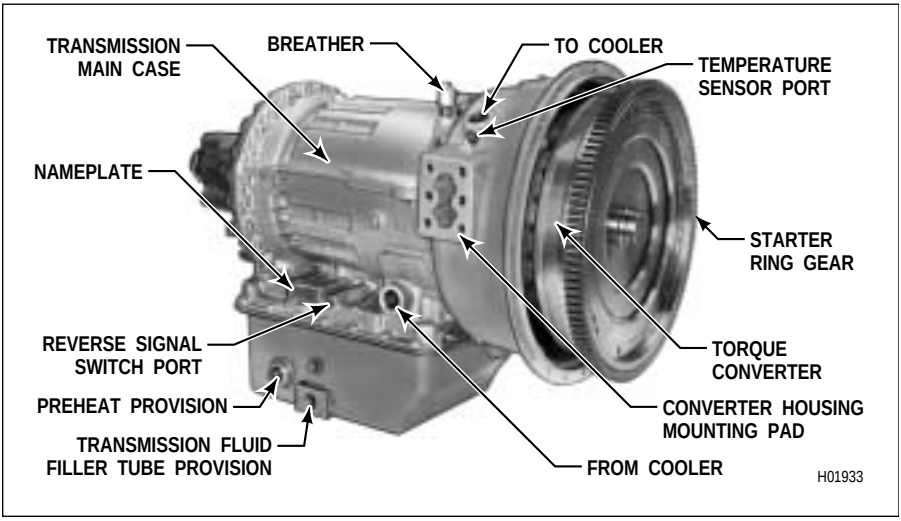
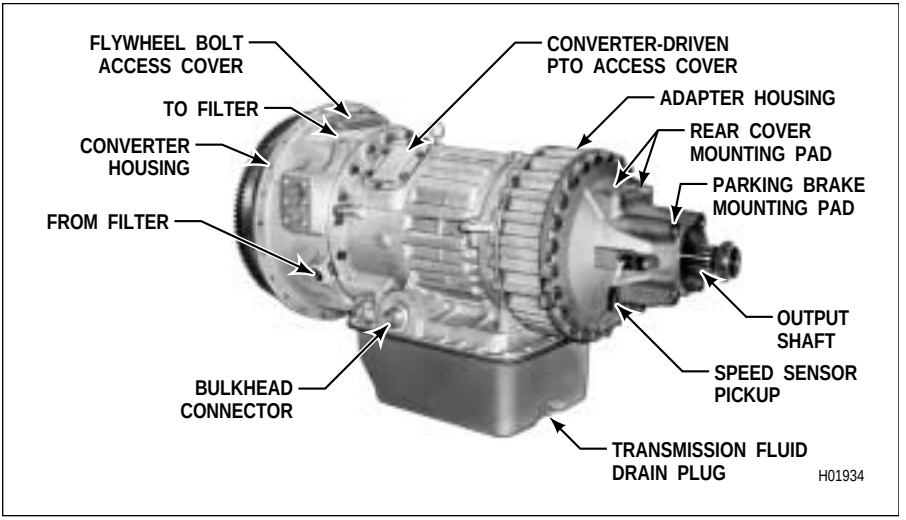
Pro-Link® is a registered trademark of Micro Processor Systems, Inc.



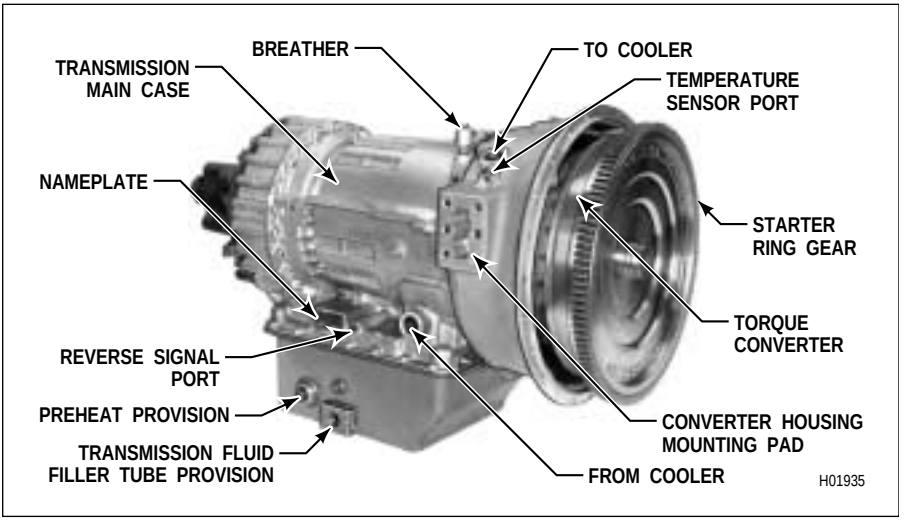
Model HT 741, 748 Transmission — Left-Rear View



Model HT 741, 748 Transmission — Right-Front View



Model HT 755CR Transmission — Left-Rear View



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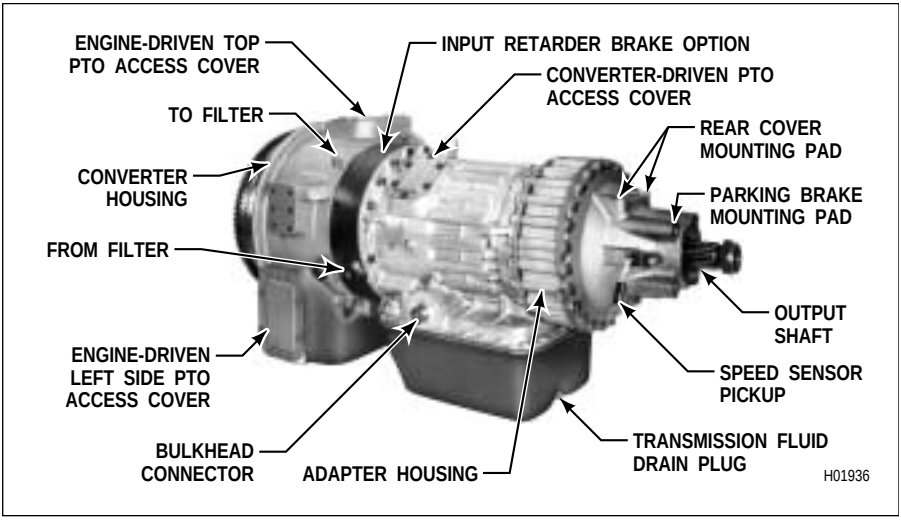
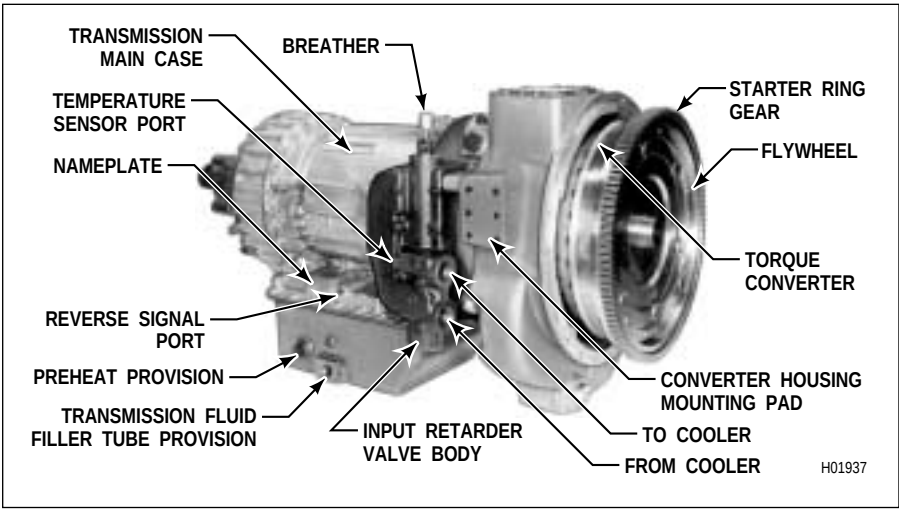
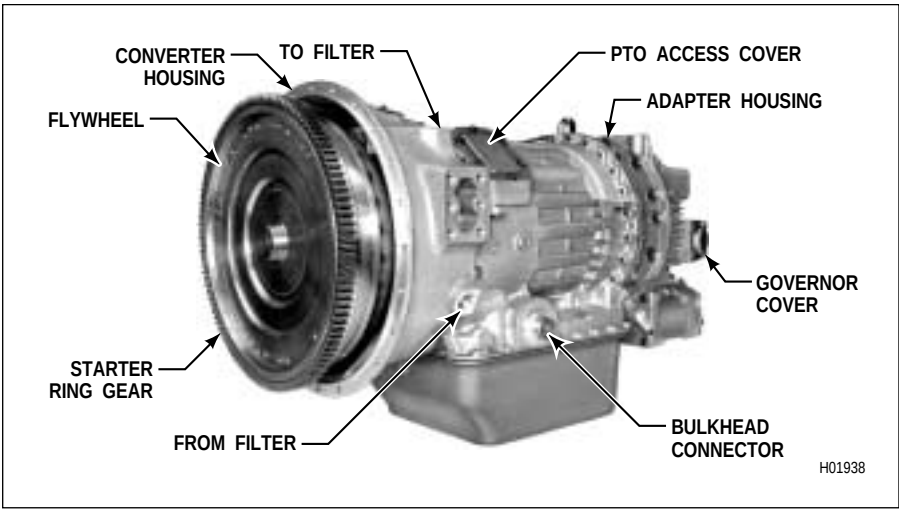


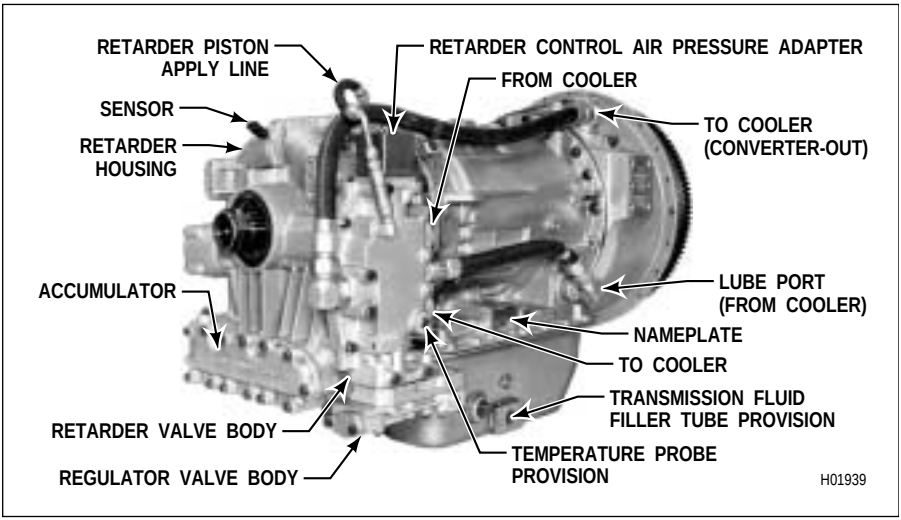
Model HT 755DR Transmission — Left-Rear View (With Input Retarder)



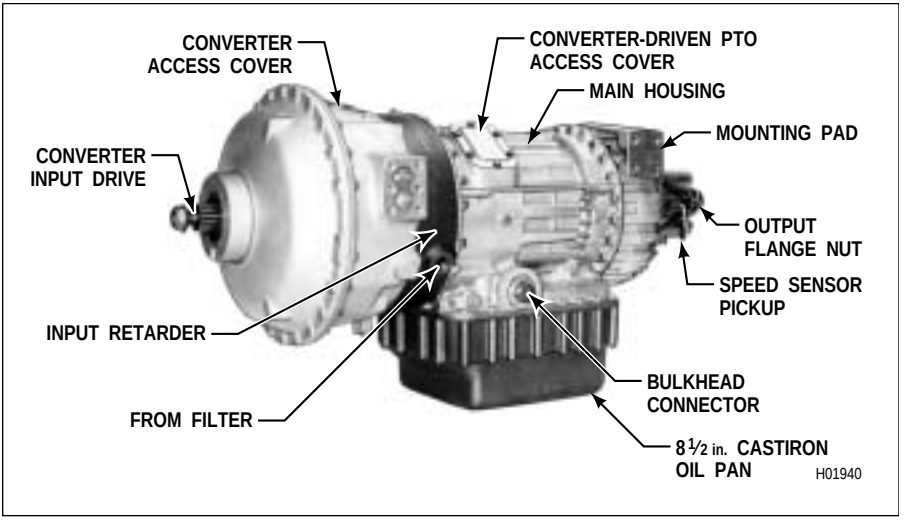
Model HT 755DR Transmission — Right-Front View (With Input Retarder)



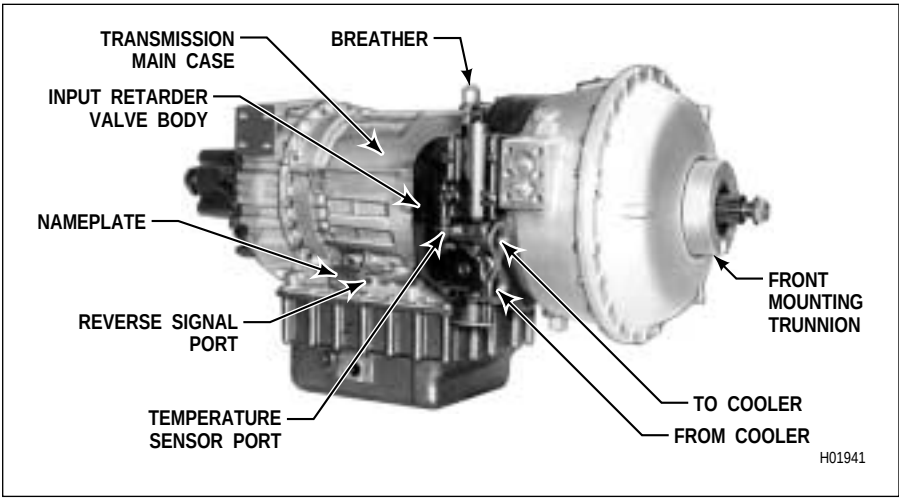
Model HTB 748 Transmission — Left-Front View (With Output Retarder)



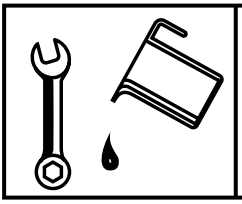
Model HTB 748 Transmission — Right-Rear View (With Output Retarder)



Model CLBT 755 Transmission — Left-Front View



Model CLBT 755 Transmission — Right-Front View



PREVENTIVE MAINTENANCE

SECTION I

1–1. PERIODIC INSPECTION AND CARE

Clean and inspect the exterior of the transmission at regular intervals. Severity of service and operating conditions determine the frequency of these inspections. Inspect the transmission for:

- loose bolts — transmission and mounting components
- fluid leaks — repair immediately
- loose, dirty, or improperly adjusted throttle sensor linkage
- damaged or loose hoses
- worn, frayed, or improperly routed electrical harnesses
- worn or out-of-phase driveline U-joints and slip fittings

CAUTION: When welding on the vehicle:

- **DO NOT WELD** on the vehicle without disconnecting from the ECU all control system wiring harness connectors.
- **DO NOT WELD** on the vehicle without disconnecting ECU battery power and ground leads.
- **DO NOT WELD** on any control components.
- **DO NOT CONNECT** welding cables to any control components.

A label describing on-vehicle welding precautions is available from your authorized Allison service dealer and should be installed in a conspicuous place. A vehicle used in a vocation that requires frequent modifications or repairs involving welding must have an on-vehicle welding label.

1–2. IMPORTANCE OF PROPER TRANSMISSION FLUID LEVEL

Because the transmission fluid cools, lubricates, and transmits hydraulic power, it is important that the proper fluid level be maintained at all times. If the fluid level is too low, the torque converter and clutches will not receive an adequate supply of transmission fluid, and the transmission will overheat. If the fluid level is too high, the fluid aerates — causing the transmission to shift erratically and overheat. Fluid may be expelled through the breather or dipstick tube when the fluid level is too high.

A severely low fluid level causes the Allison Transmission Electronic Control to do two things automatically —

- Turn on the CHECK TRANS light
- Prevent upshifting into the highest range

When the fluid level is corrected, the transmission will return to normal operation.

Do not use the Electronic Control to replace regular fluid level checks. Check the level at the intervals specified in your vehicle service instructions.

1–3. TRANSMISSION FLUID CHECK PROCEDURES

WARNING: Take the following precautions so that unexpected, possible sudden vehicle movement is avoided. Whenever it becomes necessary to leave the vehicle, even momentarily, while the engine is running, place the transmission shift selector in Neutral, set the parking brake and/or emergency brakes and chock the wheels.

a. Fluid Check Procedure.

Clean all dirt from around the end of the fill tube before removing the dipstick. Do not allow the dirt or any foreign matter to enter the transmission. Dirt or foreign matter may cause undue wear of the transmission parts, make valves stick, and clog passages. Check the fluid level, manually, using the following procedure and record the level in your maintenance log. To perform the fluid level check, the engine must be running at idle speed and the transmission must be in **N** (Neutral).

Add transmission fluid to the transmission through the fill tube opening. Be sure to use proper transmission fluid and fluid containers as discussed in Sections 1–4 and 1–5. Refer to Table 1–1 for approximate transmission fluid capacity.

Table 1–1. Transmission Fluid Capacity

Application	U.S. Quarts	Liters
4½ inch (114 mm) oil pan	34	32
6 inch (152 mm) oil pan	30	28.5
7 inch (178 mm) oil pan	30	28.5
8½ inch (215 mm) oil pan	43	41
NOTE: Does not include external circuits.		

b. Cold Check.

NOTE:

The purpose of the Cold Check is to determine if the transmission has enough fluid to be safely operated until a hot check can be made.

- Park the vehicle on a level surface. Apply the parking brake, and chock the wheels.

CAUTION: The fluid level rises as fluid temperature increases. DO NOT fill above the "COLD RUN" band if the transmission fluid is below normal operating temperatures.

- Run the engine for at least one minute. Shift to **D** (Drive) and then to **R** (Reverse) to clear the hydraulic circuits of air. Then shift to **N** (Neutral) and allow the engine to idle (500–800 rpm).
- Insert the dipstick into the tube and remove. Check the fluid level reading. Repeat the check procedure to verify the reading.
- If the fluid level is within the "COLD RUN" band, the transmission may be operated until the fluid is hot enough to perform a "HOT RUN" check. If the fluid level is not within the "COLD RUN" band, add or drain as necessary to bring it to the middle of the "COLD RUN" band.
- Perform a hot check as soon as the normal operating temperature of 160–200°F (71–93°C) is reached.

c. Hot Check.

CAUTION: The transmission fluid must be hot to ensure an accurate check. The fluid level rises as temperature increases.

- Operate the transmission in **D** (Drive) until normal operating temperature is reached:

  160–200°F (71–93°C) sump temperature
  180–220°F (82–104°C) converter-out temperature

- Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake, and chock the wheels. Allow the engine to idle.
- With the engine running, remove the dipstick from the tube and wipe it clean.
- Insert the dipstick into the tube and remove. Check fluid level reading. Repeat the check procedure to verify the reading.

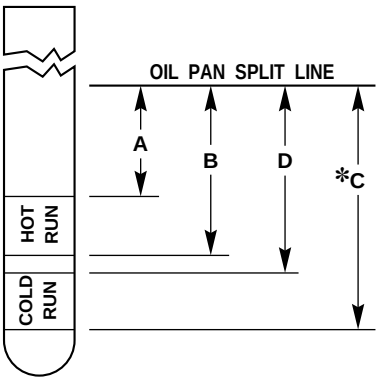
NOTE:

Safe operating level is within the "HOT RUN" band on the dipstick, Figure 1–1.

- If the fluid level is not within the "HOT RUN" band, add or drain as necessary to bring the fluid level to within the "HOT RUN" band.

d. Consistency of Readings.

- Always check the fluid level at least twice and with the engine running. Consistency is important to maintain accuracy of the reading. If inconsistent reading persists, check the transmission breather to be sure it is clean and unclogged.



HT/CT PAN SIZE	DIM A	DIM B	DIM C*	DIM D
4.50"	25.4 mm (1.00 IN.)	38.1 mm (1.50 IN.)	50.8 mm (2.00 IN.)	44.5 mm (1.75 IN.)
6.00"	38.1 mm (1.50 IN.)	63.5 mm (2.50 IN.)	95.3 mm (3.75 IN.)	76.2 mm (3.00 IN.)
7.00"	63.5 mm (2.50 IN.)	88.9 mm (3.50 IN.)	120.7 mm (4.75 IN.)	N/A
8.50"	63.5 mm (2.50 IN.)	88.9 mm (3.50 IN.)	120.7 mm (4.75 IN.)	N/A

*Approximate Dimension, OEM/Customer is to establish COLD RUN BAND at installation.

V01889

Figure 1–1. Typical Dipstick Markings

1–4. KEEPING TRANSMISSION FLUID CLEAN

CAUTION: Containers or fillers that have been used for any antifreeze or engine coolant solution must not be used for the transmission fluid. Antifreeze and coolant solutions contain ethylene glycol which, if introduced into the transmission, can cause the clutch plates to fail.

Transmission fluid must be handled in clean containers, fillers, etc., to prevent foreign material from entering the transmission. Clean around the filler tube before removing the dipstick. Lay the dipstick in a clean place while filling the transmission.

1–5. AUTOMATIC TRANSMISSION FLUID RECOMMENDATIONS

- Hydraulic fluids (oils) used in the transmission are important influences on transmission performance, reliability and durability. DEXRON®-III fluid is recommended for light-duty applications. Type C-4 fluids are recommended for severe-duty applications.
- Some DEXRON®-III fluids are also qualified as Type C-4 fluids. To ensure the fluid is qualified for use in Allison transmissions, check for a DEXRON®-III or C-4 fluid license, or approval numbers on the container, or consult the lubricant manufacturer. Consult your Allison Transmission dealer or distributor before using other fluid types; fluid types such as Type F, and universal farm fluids may or may not be properly qualified for use in your Allison transmission.

CAUTION: Disregarding minimum fluid temperature limits can result in transmission malfunction or reduced transmission life.

- When choosing the optimum viscosity grade of fluid to use, duty cycle, preheat capabilities, and/or geographical location must be taken into consideration. Table 1–2 lists the minimum fluid temperatures at which the transmission may be safely operated. Preheat with auxiliary heating equipment or by running the vehicle with the transmission in **N** (Neutral) for a minimum of 20 minutes before attempting range operation.

Table 1–2. Operating Temperature Requirements for Transmission Fluid

Viscosity Grade	Ambient Temperature Below Which Preheat Is Required	
	Fahrenheit	Celsius
DEXRON®-III	–17	–27
SAE 10W	–4	–20
SAE 15W-40	5	–15
SAE 30	32	0
SAE 40	50	10
Ref. 13-TR-90.		

1–6. TRANSMISSION FLUID AND FILTER CHANGE INTERVALS

a. Frequency.

Transmission fluid and filter change frequency is determined by severity of transmission service and by the filter equipment installed. Table 1–3 is a general guide. More frequent changes may be required when operating conditions create high levels of contamination or overheating.

Table 1–3. Transmission Fluid and Filter Change Intervals

Fluid Change Interval	Internal Sump and Governor Filter	Standard Main Pressure External Filter**
50,000 miles (80 000 km) or 12 months or 1200 hours*	At overhaul	After first 5000 miles (8 000 km) and at each 25,000 miles (40 000 km) or 6 months or 600 hours, thereafter*

* Whichever occurs first.

** An Allison high efficiency filter may be used until the change filter light indicates it is contaminated or until it has been in use for three years, whichever occurs first. No mileage restrictions apply.

b. Abnormal Conditions. Transmission fluid must be changed whenever there is evidence of dirt or a high temperature condition. A high temperature condition is indicated by the transmission fluid being discolored or having a strong odor, or by fluid analysis. Local conditions, severity of operation, or duty cycle require more or less frequent fluid or filter change intervals.

c. Fluid Analysis. Transmission protection and fluid change intervals can be optimized by monitoring fluid oxidation according to the tests and limits shown in the Table 1–4. Consult your telephone directory for fluid analysis firms. To ensure consistent and accurate fluid analysis, select only one fluid analysis firm. Refer to the latest edition of GN2055EN, Technician's Guide for Automatic Transmission Fluids.

Table 1–4. Fluid Oxidation Measurement Limits

Measurement	Limit
Viscosity	±25% change from new fluid
Carbonyl absorbance	+0.3 A*/0.1 mm change from new fluid
Total acid number	+3.0 change from new fluid
Solids	2% by volume maximum
* Note: A = Absorbance units.	

1–7. FLUID TEMPERATURES

- If the sensor is located in the converter housing or input retarder valve, the critical temperatures are listed in the converter-out column. If the sensor is located in some other area, refer to the vehicle manual for the critical temperatures. If the maximum fluid temperature is reached, follow this procedure:

  — Stop the vehicle and shift the transmission into **N** (Neutral) and operate the engine at 1500 rpm to reduce the transmission fluid temperature.

  — If the transmission fluid does not cool in approximately 30 seconds, or if it continues to overheat after operation is continued, stop the vehicle and engine and locate the problem.

Table 1–5. Fluid Temperatures

Condition		Converter-Out
Converter Operation	— CLBT 700 Series — HT 700 Series	275˚F (135˚C) max 300˚F (149˚C) max
Retarder Operation	— Intermittent	330˚F (166˚C) max
Lockup Operation		250˚F (121˚C) max
Normal Operation		180–220˚F (82–105˚C)

1–8. HIGH-EFFICIENCY, MAIN-PRESSURE EXTERNAL FILTER CHANGE

Allison high-efficiency external filters, which have a change filter indicator, do not need to be changed when the transmission fluid is changed unless restriction is indicated. There is no mileage limitation with the use of Allison high-efficiency filters.

An Allison high-efficiency external filter element must be changed if the engine and transmission are at operating temperature (over 160°F; 71°C) and the **Change Filter** light is illuminated for **any** length of time or the element has not been changed for three years, whichever occurs first.

1–9. TRANSMISSION FLUID CONTAMINATION

a. Examine At Fluid Change. At each transmission fluid change, examine the fluid that is drained for evidence of dirt or water. A normal amount of condensation will emulsify in the fluid during operation of the transmission. However, if there is evidence of water, check the cooler (heat exchanger) for leakage between the water and fluid areas. Fluid in the water side of the cooler (heat exchanger) is another sign of leakage. This, however, may indicate leakage from the engine oil system.

b. Metal Particles.

CAUTION: If excessive metal contamination has occurred, replace the cooler and all bearings within the transmission.

Metal particles in the transmission fluid or on the magnetic drain plug (except for the minute particles normally trapped in the filter) indicate damage has occurred in the transmission. When these particles are found in the sump, the transmission must be disassembled and closely inspected to find the source. Metal contamination will require complete disassembly of the transmission and cleaning of all internal and external circuits, cooler, and all other areas where the particles could lodge. During the repair of a major internal failure of a transmission, it should be dismantled into as many serviceable detail parts as possible and thoroughly cleaned. **Do not disassemble the unit just to the problem area**.

c. Coolant Leakage.

- The presence of ethylene glycol coolant in the transmission fluid is detrimental to the reliability and durability of the internal components. Ethylene glycol has a deteriorating effect on friction-faced clutch plates and nonmetallic components (seals, gasket, etc.) and on highly loaded steel parts, such as bearings and gears, due to reduced lubricity of the fluid.

d. If the presence of ethylene glycol in the fluid is suspected, immediately perform a verification test. A Gly-Tek test kit is available and is a quick and easy method to determine the presence of glycol. If glycol is found, disassemble and inspect the transmission, and remove all traces of coolant and varnish deposits resulting from coolant contamination. Replace all seals, gaskets, and friction-faced clutch plates. Repair or replace the cooler prior to installation of the new or rebuilt transmission.

1–10. TRANSMISSION FLUID AND FILTER CHANGE PROCEDURE

NOTE:

Do not drain the transmission fluid if only filters are being replaced.

a. Drain Fluid.

- Drain the fluid when the transmission is at operating temperature — 160–200°F (71–93°C). Hot fluid flows quicker and drains thoroughly.
- Remove the drain plug from the oil pan and allow the fluid to drain into a suitable container.
- Examine the fluid as described in the Section 1–8.

b. Replace Filters.

- Refer to the latest edition of the HT 700 Series Service Manual SM2004EN for complete procedures for replacement of the filter.
- Remove the oil pan, and replace the old filter with the new one.

c. Refill Transmission. The amount of refill fluid is less than the amount used for the initial fill. Fluid remains in the external circuits and transmission cavities after draining the transmission. After refill, check the fluid level using the procedure described in Section 1–3.

1–11. AUXILIARY FILTER

- If a condition occurs that introduces debris into the transmission hydraulic system, a complete cleanup of the cooler and lines is required.
- Because repeated cleaning and flushing may not remove all debris, install an auxiliary filter in the cooler-out circuit (models without an output retarder), or in the lubrication circuit (models with an output retarder). This recommendation applies whether the transmission is overhauled or replaced by a new or rebuilt unit.
- If any doubt exists about the cleanup of the cooler, replace the cooler.

- The auxiliary filter must have at least a 40-micron filter element or finer and a maximum filter pressure drop of 2 psi (14 kPa) at 15 gpm (57 liters/minute) at 180˚F (82˚C). The maximum external circuit pressure drop must not exceed 30 psi (207 kPa) at 15 gpm (57 liters/minute) at operating temperature, in **D** (Drive) at full throttle stall.
- The following auxiliary filters are recommended:

Table 1–6. Auxiliary Filter Recommendations

Filter Assembly	Filter Element
Allison 29510921*	Allison 29510918*
AC PM 13-16	PF 897
AC PM 16-1	PF141
FX 11583	HF6520
Fram HP 1-1	HP 1 or AC HD 222
Purolator OF-15C-1	OF-2C-1
Purolator 20-10	PER-20

* High-efficiency filter and element are available from your authorized Allison distributor.
Ref: SIL 12-TR-93 (latest revision)

1–12. BREATHER

a. Location and Purpose. The breather is located on top of the transmission housing. The breather prevents air pressure buildup within the transmission and its passage must be kept clean and open.

b. Maintenance. The amount of dust and dirt encountered will determine the frequency of breather cleaning. Use care when cleaning the transmission. DO NOT SPRAY STEAM, WATER, OR CLEANING SOLUTION DIRECTLY AT THE BREATHER. Spraying steam, water, or cleaning solution directly at the breather can force the water or cleaning solution into the transmission.

c. Replacement. Always use a wrench of the proper size to remove or replace the breather. Pliers or a pipe wrench can crush or damage the stem and produce metal chips which could enter the transmission. Tighten the breather to 9–12 lb ft (12–16 N·m).

1–13. TRANSMISSION STALL TEST AND NEUTRAL COOL-DOWN CHECK

WARNING: When conducting a transmission stall test, the vehicle must be prevented from moving. Apply the parking brake and service brakes and block the vehicle securely. Warn personnel to keep clear of the vehicle and its travel path. Failure to do so can cause serious injury.

a. Purpose.

The stall test provides a method for determining if the malfunction is in the engine or in the transmission when a vehicle is not performing satisfactorily.

The neutral cool-down check utilizes the two-minute cooling period on the stall test to gather transmission fluid temperature data for troubleshooting reference.

b. Transmission Stall Test Procedure. The engine stall point (rpm) under load is compared to the engine manufacturer's specified rpm for the stall test.

NOTE:

The engine manufacturer's test data must be available for the stall test. This data can be obtained from the engine manufacturer, or from your equipment dealer or distributor.

- Connect a tachometer of known accuracy to the engine and install a temperature probe into the converter-out (to cooler) line. Bring the transmission to the normal operating temperature 160–200°F (71–93°C).

CAUTION: Do not attempt to stall test any transmission in reverse range. Do not attempt to stall test the 755DR Series transmission in first (low) gear. The torque produced in that gear can damage the vehicle driveline.

- On the 755 Series transmissions, shift the selector to **D** (Drive) range or utilize the optional stall check feature. On the 741 or 748 Series, shift to any forward range.

CAUTION: Never maintain the stall condition for more than 30 seconds at any one time because of the rapid rise in transmission fluid temperature. Do not let the converter-out temperature exceed 300°F (149°C). Do not rely on converter-out temperature to limit stall duration. During stall conditions, internal temperatures rise much faster than converter-out temperature. If the stall test is repeated, do not let the engine overheat.

- With the vehicle blocked, parking brake and service brake applied, hold the engine at wide-open throttle. When the converter-out temperature reaches a minimum of 255°F (124°C), record the engine speed.
- Reduce engine speed to idle and shift to **N** (Neutral).

c. Neutral Cool-Down Check Procedure. The neutral cool-down check determines if the transmission fluid cools following an engine load condition. Perform this check immediately after the engine speed has been recorded in the stall test.

- Record the converter-out temperature.
- With the transmission remaining in Neutral, run the engine at 1200–1500 rpm for two minutes to cool the transmission fluid.
- At the end of two minutes, record the converter-out temperature.

d. Results.

NOTE:

Environmental conditions, such as ambient temperature, altitude, engine accessory loss variations, etc., affect the power input to the converter. Under such conditions, a stall speed deviation within ±150 rpm of specification can be accepted as within normal range.

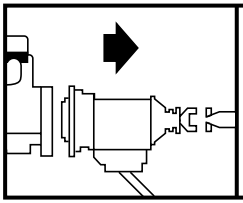
If engine stall speed is more than 150 rpm below the stall speed specified by the engine manufacturer, an engine problem is indicated, such as need for tune-up.

If engine stall speed is more than 150 rpm above specification, a transmission problem is indicated, such as slipping clutches, cavitation, or torque converter failure. Refer to Section 2–6 for the applicable service manual number.

An extremely low stall speed, such as 33 percent of the specified engine stall rpm, during which the engine does not smoke, could indicate a freewheeling stator.

If the engine stall speed conforms to specification, but the transmission fluid overheats, refer to the cool-down check. If the transmission fluid does not cool during the two-minute cool-down check, a stuck stator can be indicated.

If the engine stall speed conforms to specification and the cool-down check shows that transmission fluid cools properly, refer to Troubleshooting Manual TS2712EN.



REMOVING TRANSMISSION FROM VEHICLE

SECTION
II

2–1. DRAINING TRANSMISSION

Drain the transmission fluid before the transmission is removed from the vehicle.

- Remove the drain plug from the oil pan. Examine the drained transmission fluid for evidence of contamination (see Section 1–9). Reinstall the drain plug.
- Remove transmission fluid fill tube if it interferes with transmission removal.

NOTE:

A significant amount of transmission fluid may drain from the hydraulic lines when they are disconnected from the transmission.

- Disconnect all other hydraulic lines from the transmission. Remove the lines from the vehicle if they will interfere with the transmission removal. Plug all hose openings to keep dirt from entering the hydraulic system.

2–2. DISCONNECTING CONTROLS

- Disconnect or completely remove the electronic controls. If controls are not removed from the transmission, position them so they do not interfere with transmission removal.
- Disconnect the electronic control chassis harness from the transmission main connector and from the speed sensor connector (Figure 2–1).
- If an external pressure switch for a reverse signal is used, disconnect vehicle harness from switch.
- Disconnect the speedometer drive cable, if used.
- Disconnect the air supply line at the output retarder control valve (if output retarder is used).
- Disconnect the input retarder control linkage (if input retarder is used).

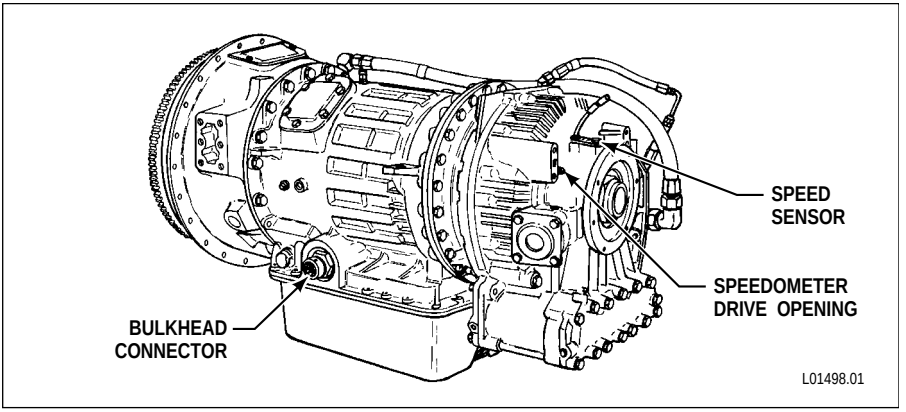
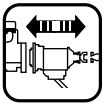


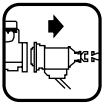
Figure 2–1. Disconnect Locations

2–3. UNCOUPLING FROM DRIVELINE, ENGINE, AND VEHICLE



- Disconnect the vehicle driveline from the transmission output flange. Position the disconnected shaft to avoid interference when removing the transmission.
- If transmission mounts support the rear of the engine, place a jack or other support under the engine.
- Support the transmission securely on a hoist, jack, or other suitable removal equipment.
- Remove all bolts, nuts, washers, spacers, and supports that attach the transmission to the vehicle and to the engine (reference Figure 4–1).

2–4. REMOVING THE TRANSMISSION



- Move the transmission away from the engine until it is completely clear of the engine. If used, remove the adapter ring and/or gasket.
- Raise or lower the transmission as necessary to remove it from the vehicle.

2–5. REMOVING INPUT AND OUTPUT FLANGES OR YOKES

When replacing the transmission, it may be necessary to transfer input and output flanges or yokes to the replacement transmission. If the flanges or yokes are retained by a large self-locking nut, follow specific procedures below for removal of the nut.

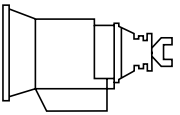
CAUTION: The use of an impact wrench for removing the input or output nut requires a means to hold the flange. Failure to hold the flange can cause internal damage to the transmission.

- Before removing the self-locking nut, check to see if there are any notches cut into the wrenching flats. If there are five notches, remove the nut and throw it away.
- If there are less than five notches or none at all, remove dirt and burrs from the shaft thread. Then loosen the nut until there is about 1⁄16 inch gap between the nut and flange.
- Check the running torque as the nut is being removed. The first time the nut is removed (no notches), running torque must be at least 400 lb in. (45 N·m). Each additional time the nut is removed (one to four notches), running torque must be at least 300 lb in. (34 N·m). Discard the nut if it does not meet the running torque limit.

2–6. REBUILD, OVERHAUL INSTRUCTIONS

Refer to the latest edition of the following Service Manuals for rebuild or overhaul of the transmission:

— HT, HTB 700 Electronic Control Series Service Manual SM2004EN
— CL(B)T 700 Series Service Manual SM1314EN, with CL(B)T 755 Electronic Control Series Service Manual Supplement SM1992EN

SECTION III	PREPARING THE TRANSMISSION FOR INSTALLATION	

3–1. CHECKING INPUT COMPONENTS

a. Bolt Holes. Check all bolt holes on the front of the flywheel/converter/flexplate adapter. The threads must be undamaged, and the holes must be free of any chips or foreign materials.

b. Pilot Boss. Check the pilot boss (at center of flywheel) for damage or raised metal which could prevent bolt free entry into the flex disk hub (adapter).

c. Starter Ring Gear. Check the starter ring gear for excessive wear or damage.

d. Transmission Mounting Flange. Check the transmission mounting flange for raised metal, dirt, or pieces of gasket material.

e. Transmission-To-Engine Mounting Flange. Inspect the transmission-to-engine mounting flange for raised metal, burrs, or pieces of gasket material. Also inspect the threaded holes for damaged threads.

3–2. INSTALLING OUTPUT FLANGE AND INPUT FLANGE (REMOTE-MOUNTED TRANSMISSION)

a. Output Oil Seal. Check the output flange rear oil seal and input front flange oil seal for leaks or damage. Replacement instructions are in the HT, HTB 700 Electronic Control Series Service Manual SM2004EN, and CL(B)T Series Service Manual SM1314EN with CL(B)T 755 Electronic Control Series Service Manual Supplement SM1992EN. Lubricate the oil seals with high-temperature grease or transmission fluid.

b. Check Yoke. Inspect each flange or yoke for damage or wear. The oil seal contact surface must be smooth and regular to prevent transmission fluid leaking past the seal. Rotate the flange during installation to avoid seal lip damage.

c. Installing the Parking Brake. Install the parking brake assembly on the parking brake mounting pads on the transmission, and tighten the bolts to the vehicle manufacturer specifications.

d. Installing Output Yoke. Install the rear output yoke on the rear output shaft.

3–3. INSTALLING PTO

Access to the PTO mounting pads and the space available to maneuver the transmission determine whether the PTO should be installed before or after the transmission is installed.

CAUTION: DO NOT use cork or other soft gaskets to install the PTO. Use only the shims/gaskets listed in the appropriate parts catalog of your transmission model.

NOTE:

DO NOT use sealing compounds — they are usually incompatible with automatic transmission fluid.

a. Install Guide Pins — Included in the PTO Installation Kit. Determine the required position of the guide pins in relation to the mounted position of the PTO. The guide pins must align with the two blind holes in the PTO. Install two headless guide pins into the converter-housing PTO pad. Tighten the pins.

b. Determine the Backlash and Proper Gasket/Shim. You might have a turbine-driven PTO or an engine-driven PTO.

- For the turbine-driven PTO, the prescribed backlash between the drive gear (in the transmission) and the driven gear (in the PTO) is 0.018–0.024 inch (0.46–0.60 mm) prior to S/N 32404, and 0.006–0.029 inch (0.16–0.73 mm) after S/N 32403 models.
- For the engine-driven PTO, the prescribed backlash is 0.006–0.029 inch (0.16–0.73 mm).
- Refer to the latest edition of Service Manual SM2004EN for the description of the method to determine the backlash. Establish proper backlash by selecting proper thickness of shims (gaskets).

c. Mount the PTO. Mount the PTO on the guide pins, meshing the PTO driven gear with the PTO drive gear. Retain the PTO by installing a bolt in the top bolt hole. Install the remaining bolts. Tighten the bolts to 51–61 N.m (38–45 lb ft).

CAUTION: PTO units using transmission main pressure to engage the PTO driven gear must have a positive main pressure shut-off at the solenoid valve when the PTO is not engaged.

3–4. INSTALLING TRANSMISSION FILL TUBE AND SEAL

a. Inspection. Inspect the fill tube for proper vent location and vent hole diameter; a vent hole should be located on the underside of the tube and just below the seal of the dipstick, and the diameter should measure 0.060–0.080 inch (1.6–2.0 mm).

b. Location. The filler tube may be mounted on either the left or the right side. The unused fill tube provision must have an expansion plug installed in the fill tube opening.

CAUTION: Install the fill tube brackets with the correct length bolt. Too long a bolt may cause cracks and leaks in the main housing. Refer to the appropriate HTB 700 Series Parts Catalog PC1965EN or CLT 700 Series Parts Catalog PC1993EN.

c. Installation. Install the fill tube into the main housing. Insert the fill tube through the seal. Align the tube bracket with its bolt location. Install the fill tube bolts and tighten to 14–18 lb ft (19–24 N·m).

3–5. CHECKING PLUGS, OPENINGS

Check carefully at all sides of the transmission for loose or missing hydraulic pressure check plugs.

- The ⅛ inch pipe plugs should be tightened to 48–60 lb in. (5.5–6.7 N·m).
- Check the four openings into which the cooler and filter lines connect, for cleanliness. Remove any closures or obstructions.
- Check the drain plug for tightness. The drain plug must be tightened to 15–20 lb ft (21–27 N·m).
- Check the main electrical connector in the transmission housing for cleanliness.

PREPARING VEHICLE FOR TRANSMISSION INSTALLATION

SECTION IV

4–1. ENGINE, TRANSMISSION ADAPTATION REQUIREMENTS

You must ensure that a new transmission installation can be adapted to the vehicle's engine. The explained measurements in this section ensure correct transmission-to-engine adaptation. Refer to Figures 4–1, 4–2, and 4–3.

a. Measuring Equipment. Refer to the following list for the required measuring equipment.

- 24.0 inches (600 mm) precision caliper
- 2–4 inches (50–100 mm) telescoping gauge
- 1–3 inches (25–76 mm) outside micrometer
- 0–6 inches (0–150 mm) depth micrometer
- Dial indicator and mounting attachments — base, posts, and clamps

b. Flywheel Housing Pilot Bore Diameter. The flywheel housing pilot bore diameter must measure from 20.125–20.130 inches (511.18–511.30 mm).

c. Flywheel Housing Bore Runout. Flywheel housing bore runout cannot exceed 0.020 inch (0.51 mm) TIR.

d. Flywheel Housing Face Squareness. The flywheel housing face cannot be out-of-square more than 0.020 inch (0.51 mm) TIR.

e. Crankshaft Hub Pilot or Adapter Diameter. The crankshaft hub pilot or hub adapter pilot diameter must measure between 2.437–2.439 inches (61.90–61.95 mm).

f. Crankshaft Hub Pilot or Adapter Squareness. The crankshaft hub or hub adapter cannot be out-of-square more than 0.005 inch (0.13 mm) TIR.

g. Crankshaft Hub Pilot or Adapter Eccentricity. The crank shaft hub pilot or the hub adapter cannot be out-of-square more than 0.005 inch (0.13 mm) TIR.

h. Flexplate Bolt Hole Flatness. Flexplate flatness in the area of the bolt holes is not a measurement required for HT and CT 700 Series flexplates.

i. Torque Converter Axial Location. Refer to Figure 4–2. Using a depth gauge, measure from the torque converter housing to the torque converter's flexplate adapter mounting face. The torque converter axial location should measure 3.592–3.413 inches (91.24–86.69 mm).

4–2. CHECKING FLEXPLATE DRIVE ASSEMBLY

a. Flexplate Inspection. Inspect the flexplate for cracks, wear, distortion, and elongated bolt holes. Replace a damaged part.

b. Engine Crankshaft End Play. Ensure that the crankshaft end play is within the engine manufacturer's specifications.

c. Flexplate Assembly Installation. Install the flexplate onto the engine crankshaft hub using the bolts and torque values specified for that engine.

4–3. CHECKING INPUT DRIVE COMPONENTS (REMOTE-MOUNTED TRANSMISSIONS)

- Inspect shaft condition. The shaft must not be dented or bent. Welds must be sound.
- Remove any accumulation of grease and dirt.
- Inspect universal joints, yokes, coupling flanges, and slip-joint splines for wear or damage.
- Lubricate universal joints and slip-joints using the vehicle manufacturer's recommended lubricants.

NOTE:

Misindexing of driveline can cause failure of the transmission.

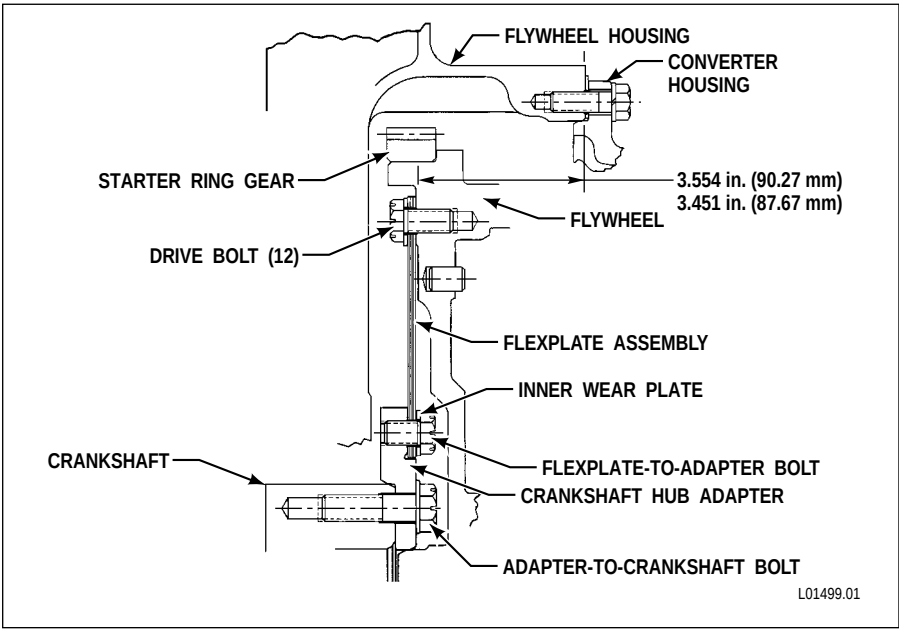


Figure 4–1. Typical Method Of Coupling Transmission To Engine

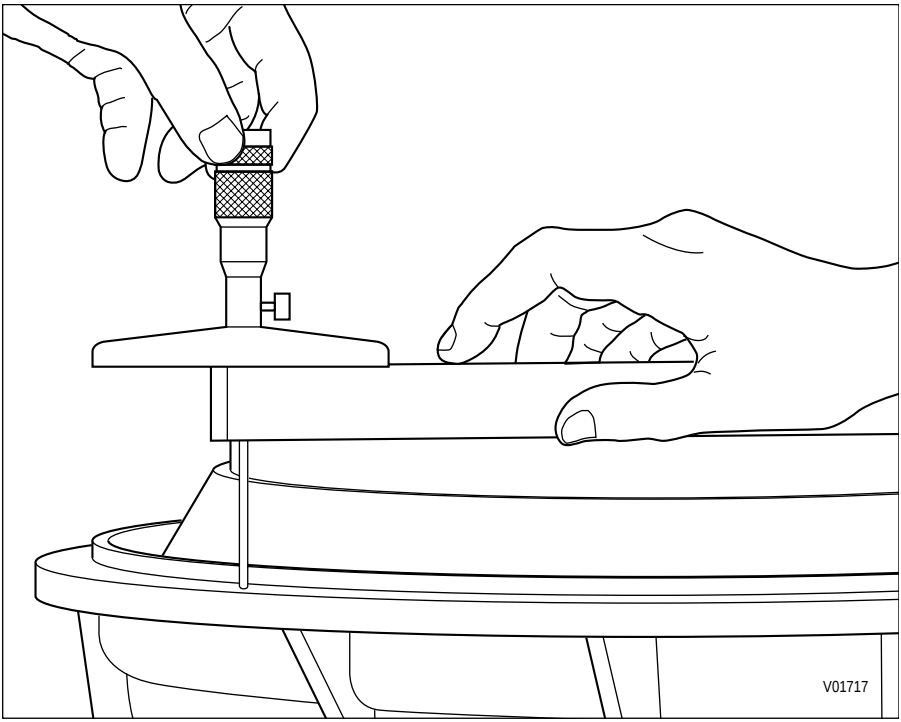


Figure 4–2. Converter Axial Location Measurement

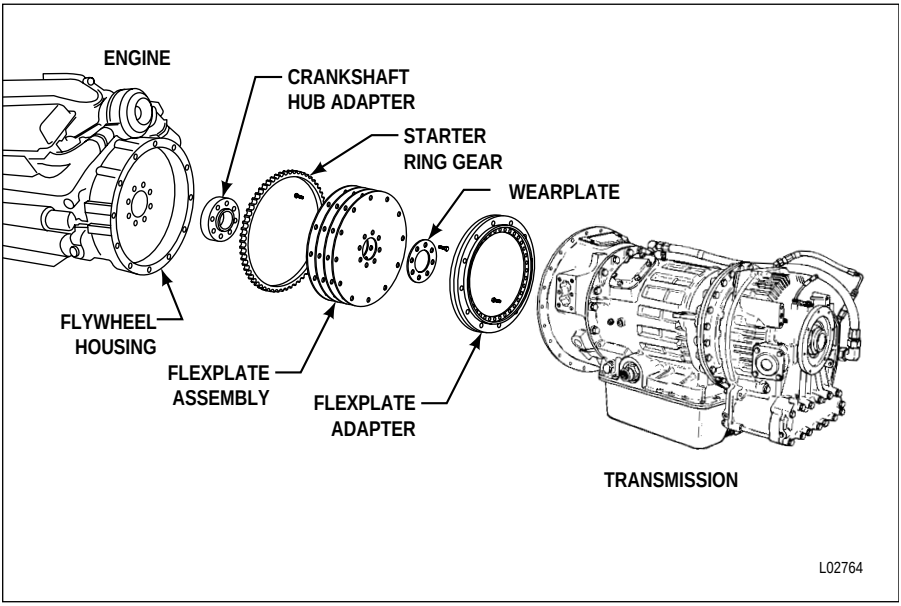


Figure 4–3. Arrangement of Adaptation Components

4–4. CHASSIS AND DRIVELINE INSPECTION

Inspect the chassis and driveline components for the following conditions, and correct them as appropriate.

- Transmission mounts — broken or worn-out
- Bolts and other hardware — damaged, missing, or incorrect
- Isolators (rubber mounts) — damaged or missing
- Driveline angles — runout, balance, or offsets which do not conform to the manufacturer's recommendations
- Driveline yoke slip joints:
  - — freedom of movement
  - — damaged or worn-out
  - — correctly lubricated
  - — correctly indexed
- Driveline midship or hanger bearings — damaged or misaligned
- Universal joints:
  - — freedom of movement
  - — damaged or worn-out
  - — correctly lubricated
  - — correctly indexed
- Vehicle differential backlash — manufacturer's specification
- Universal joint coupling — alignment and differential damage
- Cross-frame members and rear support members — condition and location
- PTO driven equipment shafts and couplings — damaged or misaligned
- Auxiliary transmission:
  - — shaft alignment
  - — alignment of yoke or flange
  - — backlash
  - — fluid leaks

4–5. COOLER, FILTER, AND LINES

a. Inspection. Perform the following and correct any faulty conditions:

- Transmission fluid cooler and related coolant lines:
  - — Check for contamination — clean and flush as necessary
  - — Inspect for deterioration
  - — Inspect for faulty connectors or kinks
  - — Clean and flush transmission fluid cooler, both coolant and oil sides. Pressure check both sides using a 40 psi (276 kPa) air supply.

- Hydraulic lines:
  - — Check for contamination — clean and flush as necessary
  - — Inspect for deterioration
  - — Inspect for faulty connectors, or kinks

b. After Overhaul. A complete cleanup of the transmission system after an overhaul cannot be assumed. Repeated cleaning and flushing may not remove all debris from the transmission fluid cooler system. Replace the transmission "from cooler" (lube) filter after 5000 miles (8000 km). Refill the transmission to the correct fluid level — refer to Paragraph 1–4.

4–6. CHECKING CONTROLS

a. Inspection. Inspect the following control components and correct any faulty conditions:

- Shift selector:
  - — proper operation
  - — proper electrical connection
  - — proper harness routing
- Speedometer drive cable:
  - — wear
  - — damage
  - — kinks
  - — lubrication
  - — proper routing
- Cab and chassis wiring harness:
  - — proper connections
  - — frayed insulation
  - — wiring damage
- Throttle sensor components:
  - — freedom of movement
  - — improper routing
  - — bellows damage
  - — improper or loose cable mounting
- Throttle sensor adjustment:
  - — accuracy
- Parking brake controls:
  - — cracks
  - — bends
  - — damaged threads
  - — clevis pins
  - — worn-out rod ends

- Hydraulic retarder control:
  - — damage
  - — wear
  - — frayed cable
  - — worn-out rod ends
  - — cotter pins
  - — lubrication
  - — proper operation
- PTO control:
  - — damage
  - — wear
  - — improper operation
  - — lubrication
- Temperature gauge:
  - — capillary tube damage (if used)
  - — sensor damage
- Fluid pressure gauge tubing:
  - — damage
  - — kinks
  - — improper routing

b. Throttle Position Sensor (TPS) Adjustment — When properly installed by the equipment manufacturer, the TPS should not need adjustment. If TPS adjustment is necessary, confirm that it has been installed to ATD specifications. The TPS is self-calibrating, and therefore has no optimum close throttle or full throttle count value. Idle count should be 50 or higher and full throttle should be 200 or lower. As long as the counts are in the 50 and 200 range, with a difference of 85 to 130 counts between closed and full throttle, the TPS is set correctly. Refer to Figure 4–4.

c. Hitch-Pin Throttle Position Sensor Installation. Refer to Figure 4–5.

- Install the throttle sensor body as follows:
  - — Clamp cable end, using clamp and shims
  - — Secure the sensor body, using the mounting holes provided.
  - — Install a heat shield if any part of the throttle sensor is near the exhaust manifold, turbocharger, or any other heat source.
- Adjust the Hitch-Pin throttle sensor as follows:
  - — The engine fuel lever must be at the closed throttle position.
  - — Install the hitch-pin cable end of the sensor to the engine fuel lever with brackets so that at the idle position, the cable end is 0.44–0.67 inch (11–17 mm) from its fully retracted position, and at wide open throttle position, the cable end is 0.60–0.90 inch (15–22.9 mm) from the idle position.

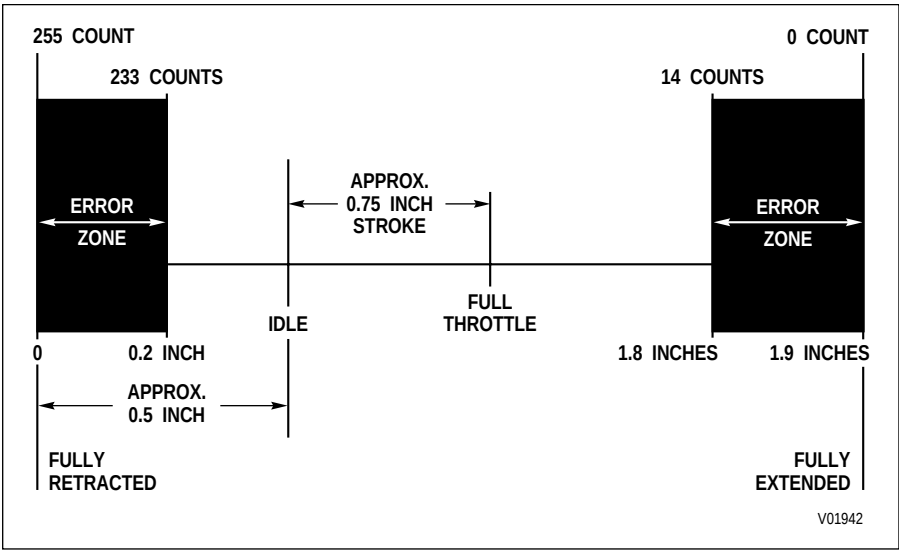


Figure 4–4. Throttle Position Determination Diagram

— Check the stroke distance of the throttle sensor, from closed to wide open. Stroke distance must be from 0.60–0.90 inch (15–22.9 mm).

— Recheck for zero clearance at the fuel lever. Make sure that the 0.60–0.90 inch (15–22.9 mm) dimension has not changed.

— Design throttle sensor linkage brackets and levers to nominal dimensions so that the system stays within tolerance band throughout its operating life.

d. Slip-Link Throttle Sensor Installation. Refer to Figure 4–6.

- Loosen ¼–20 nuts A and B enough to let the threaded shaft move to its fully retracted position.
- Make sure the engine fuel lever is at the closed throttle position.
- Tighten nut **A** against the slip-link until the threaded shaft moves 0.44–0.66 inch (11.2–16.7 mm) from its retracted position. Check to be sure there is zero clearance between the drive pin on the fuel lever and the end of the slot in the slip-link. Then tighten nut **B** securely against the slip-link.
- Recheck for zero clearance at the fuel lever. Then recheck the 0.44–0.66 inch (11.2–16.7 mm) dimension to ensure that it has not changed.
- Move the throttle from closed to wide open to check the stroke distance of the throttle sensor. The stroke distance must be within the range of 0.63–0.86 inch (16.0–21.8 mm).

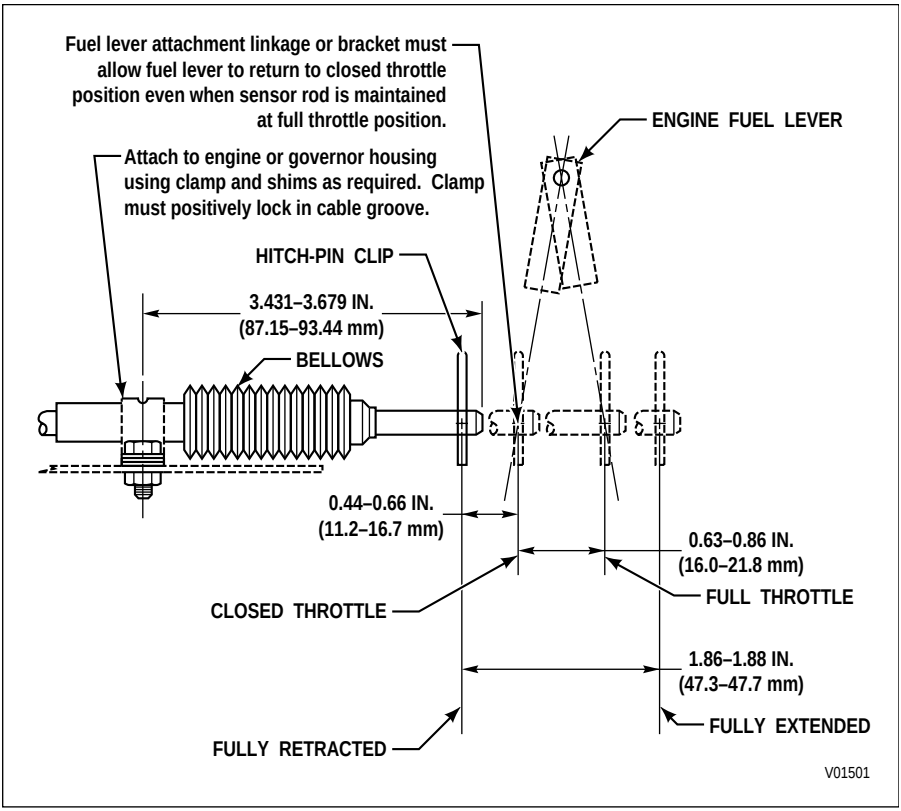

Fuel lever attachment linkage or bracket must allow fuel lever to return to closed throttle position even when sensor rod is maintained at full throttle position.
ENGINE FUEL LEVER
Attach to engine or governor housing using clamp and shims as required. Clamp must positively lock in cable groove.
HITCH-PIN CLIP
3.431–3.679 IN. (87.15–93.44 mm)
BELLOWS
0.44–0.66 IN. (11.2–16.7 mm)
0.63–0.86 IN. (16.0–21.8 mm)
CLOSED THROTTLE
FULL THROTTLE
1.86–1.88 IN. (47.3–47.7 mm)
FULLY RETRACTED
FULLY EXTENDED
V01501

Figure 4–5. Hitch-Pin Throttle Sensor Installation Diagram

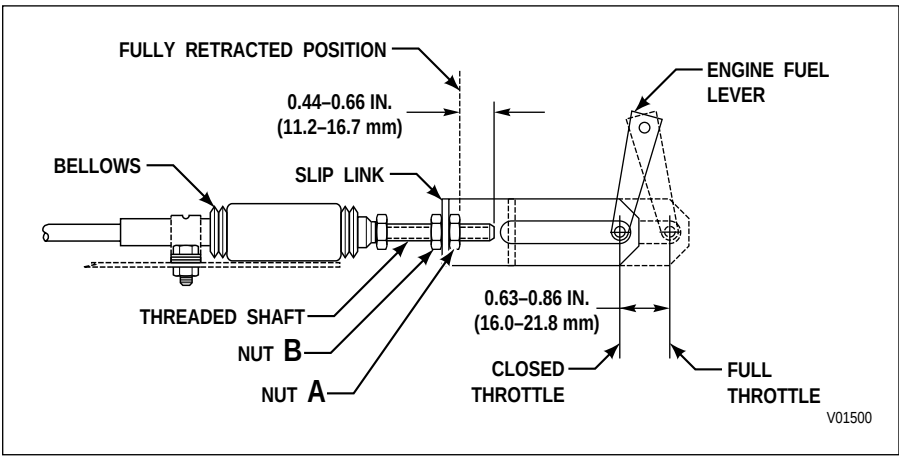
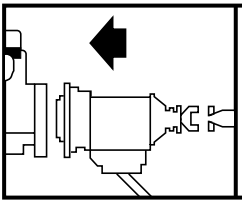


Figure 4–6. Slip-Link Throttle Sensor Installation Diagram



INSTALLING TRANSMISSION INTO VEHICLE

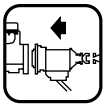
SECTION V

5–1. HANDLING

a. Preventing Damage. Carefully handle the transmission to prevent damage to components in the installation path.

b. Control of Transmission Movements. Use a hoist or transmission jack that allows precise control of transmission movement during installation.

5–2. MOUNTING TO ENGINE



- Align one of the flexplate's bolt holes in the flexplate with the access opening at the front of the engine flywheel housing.
- Install a headless guide bolt into one of the flexplate bolt holes in the flywheel (Figure 4–1). Align the guide bolt with the flexplate hole at the access opening.
- Lubricate the center pilot boss with molybdenum disulfide grease.
- Push the transmission toward the engine while guiding the pilot boss on the flywheel into the flexplate hub (adapter), and the guide bolt into the hole in the flexplate.
- Seat the transmission squarely against the engine flywheel housing. No force is required — if interference is encountered, move the transmission away from the engine and investigate the cause.
- Align the bolt holes in the converter housing with those in the engine flywheel housing. Install all of the bolts, finger tight, that retain the transmission to the engine.

CAUTION: The converter housing must be flush against the engine flywheel housing before tightening any bolts. Do not use the bolts to seat the housing.

- Tighten four bolts at 90 degree intervals around the converter housing bolt circle. Then tighten the remaining bolts. Use the torque recommended by the vehicle or engine manufacturer.

- Remove the guide bolt through the access opening in the engine flywheel housing. Replace it with a ½–20 x 1 inch self-locking bolt. Tighten the bolt finger tight at this time.

NOTE:

Do not tighten any flywheel bolts until all of the bolts have been installed and tightened finger tight.

- Rotate the engine drive shaft enough to install the eleven remaining ½–20 x 1 inch self-locking bolts into the flywheel, finger tight. When all bolts including twelve ½–20 x ¾ inch self-locking bolts are in place, tighten them to 96–115 lb ft (131–155 N·m).
- Install the flywheel housing access cover.

5–3. INSTALLING TRANSMISSION MOUNTING COMPONENTS

- Install all bolts, washers, spacers, isolators, brackets, and supports required to support the transmission in the vehicle frame.

CAUTION: Use the type and grade of mounting bolts recommended by the vehicle manufacturer.

- Tighten the bolts to the torque recommended by the vehicle manufacturer.

5–4. COUPLING TO DRIVELINE

- Couple the driveline companion flange or universal joint yoke to the flange or yoke on the transmission. Use the bolts and torque recommended by the vehicle manufacturer.
- Check the universal joint angularity (all joints in driveline) to determine if they are within the specifications of the vehicle manufacturer.

5–5. COUPLING TO ENGINE (REMOTE-MOUNTED TRANSMISSION)

- Install (if removed) the input drive shaft components that connect the engine and transmission.
- Couple the flange or yoke to the flange or yoke at the front of the transmission. Use the bolts and torque recommended by the vehicle manufacturer.
- Check the transmission to engine alignment against the vehicle manufacturer's specifications.

5–6. CONNECTING INPUT RETARDER CONTROL

- Place the operator's control at the OFF (disengaged) position.
- Check the input retarder control valve. The valve is spring-loaded to retract into the valve body when the retarder is OFF. Lift the valve upward, to the ON position, to check for the full travel of 1.5 inches (38 mm) from OFF to ON position.
- Release the valve, permitting the spring to retract the valve. Be sure the valve is fully retracted.
- Adjust the linkage so that rod end or clevis registers with the pin hole in the retarder valve. Connect the linkage to the retarder valve and check the operation of the valve. The valve must be fully extended when the operator's control is at ON.
- The valve must be fully retracted when the control is at OFF.

NOTE:

Failure to ensure a full off stroke will result in low vehicle power and transmission overheating. Failure to ensure a full on stroke will result in less than rated retarder performance.

5–7. CONNECTING OUTPUT RETARDER CONTROL

The output retarder (when used) is connected to the vehicle braking system by an air supply line.

- Connect the air supply hose fitting to the retarder control valve. Tighten the fitting to 7–10 lb ft (10–13 N·m).

5–8. CONNECTING POWER TAKEOFF CONTROLS

- If not previously installed, mount the PTO on the transmission. Refer to Paragraph 3–3 for instructions.
- Connect controls to the PTO. Check for proper operation of the controls.
- Check cable or linkage rod routing. Kinks, sharp bends, and close proximity of the cable to exhaust pipes or manifold must be avoided. Rods or linkage must not rub or interfere with adjacent parts.

CAUTION: PTOs using main transmission oil pressure to apply the PTO must have main pressure dead-headed at the PTO control valve when not in use.

- Couple the PTO output to its driven equipment. Check couplings or universal joints for proper assembly and alignment.

5–9. CONNECTING PARKING BRAKE CONTROL

- Connect and properly adjust the parking brake linkage.
- Adjust the brake shoe-to-drum clearance as specified by the manufacturer.

5–10. CONNECTING COOLER, FILTER

Figure 5–1 shows typical cooler and filter line locations.

- Be sure that the hydraulic lines are of the proper size and type recommended. Use new O-ring seals where required.
- Secure the filler tube bracket(s) as required.
- Connect the hydraulic lines to the transmission and to the cooler and external filter, checking to see that the lines are clean and unobstructed.
- Tighten the line fittings at the transmission to the torque values shown on Figure 5–1.
- Check for sharp bends, kinks, twists and for contact with components that will chafe or collapse the oil lines.
- Check to ensure that the hydraulic lines are not in close proximity to manifolds or exhaust pipes. Excessive heat will hasten the deterioration of hydraulic lines.

5–11. INSTALLING AUXILIARY FILTER

It is recommended that an auxiliary filter be installed in the cooler-circuit following cleanup. The auxiliary filter must have a 40 micron (max) filter element and a maximum filter pressure drop of 2 psi (13 kPa) at 15 gpm (57 liters/minute) at 180º F (82º C). The maximum cooler circuit pressure drop must not exceed 30 psi (206 kPa) at 15 gpm (57 liters/minute) at operating temperature and full throttle stall.

- Install the auxiliary filter.

5–12. CONNECTING SPEEDOMETER DRIVE

NOTE:

An electronic speed signal is provided by the ECU to operate an electronic speedometer. The mechanical speedometer driven gear assembly is required only if the vehicle is equipped with a mechanical speedometer.

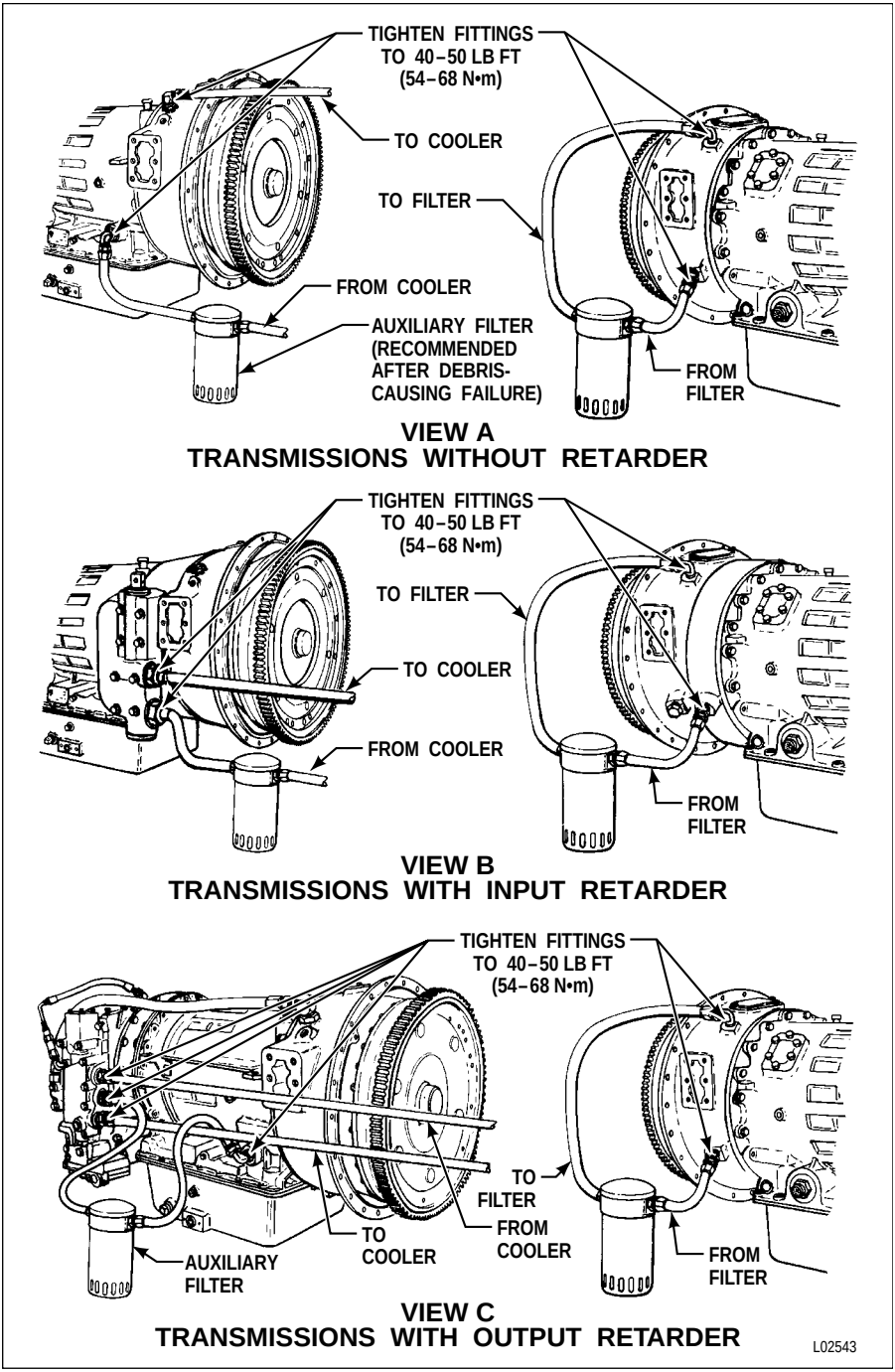


Figure 5–1. Torque Values of Typical Filter and Cooler Lines

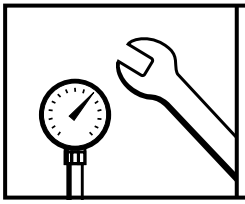
- Install the speedometer driven gear assembly into the transmission (if required). Tighten the gear assembly in the transmission rear cover to 45–50 lb ft (62–67 N·m). If no speedometer drive is provided, be sure the plug is installed to close the hole in the housing (torque is same as for gear assembly).
- Install the speedometer drive cable onto the driven gear assembly. Tighten the nut to 52 lb inch (6 N·m). Avoid kinks or sharp bends in the cable assembly. Bends must have a minimum radius of 6 inches (150 mm). No more than one 90° bend is allowed.

5–13. INSTALLING TEMPERATURE AND PRESSURE SENSORS, CONNECTING ELECTRICAL COMPONENTS

- Connect the electronic control chassis harness to the transmission main connector and to the speed sensor connector. Be sure the main connector is turned until a positive snap is felt.
- Install temperature probe (capillary tube and bulb, or thermocouple), if so equipped, into the converter housing or hydraulic retarder valve.
  - — If equipped with capillary tube and bulb, tighten the ½ inch pipe thread adapter sufficiently to prevent leakage.
  - — Install the bulb into the adapter and tighten the nut into the adapter.
  - — Check the capillary tube for interference with other parts that might chafe or damage the tube. Long tubes may require clips or brackets for support.
  - — If equipped with electrical temperature sensor, install thermocouple and connect electrical leads.
- Install and connect other electrical components such as heaters, winterization equipment, and pressure sensors.
- Install the pressure gauge tube, or line, if so equipped.
- If a reverse pressure switch is mounted on the transmission at the reverse pressure port, make the appropriate connection.
- Check that all unused hydraulic openings are plugged.

5–14. FILLING THE HYDRAULIC SYSTEM

- Select the transmission fluid.
- Fill the transmission with the required amount of fluid (refer to Section 1–9).
- Run the engine for about one minute and check the transmission fluid level (refer to Section 1–3).



CHECKS AND ADJUSTMENTS

SECTION VI

6–1. INSTALLATION CHECKLIST

Use this list after transmission installation. As items are checked, mark them off this list.

- **Torque Values**
  - ❑ Flexplate bolts — 96–115 lb ft (131–155 N·m)
  - ❑ Transmission-to-engine bolts*
  - ❑ Transmission-to-frame or mounting bolts*
  - ❑ Input flange nut — 450–550 lb ft (611–745 N·m)
  - ❑ Output flange nut — 600–800 lb ft (814–1084 N·m)
  - ❑ Companion flange or universal joint bolts*
  - ❑ Speedometer cable nut — 52 lb in. (6 N·m)
  - ❑ Speedometer body — 45–50 lb ft (62–67 N·m)
  - ❑ Hydraulic lines-to-transmission — 40–50 lb ft (55–67 N·m) max
  - ❑ Cooler lines to and from retarder — 50–59 lb ft (68–79 N·m)
  - ❑ Drain plug — 15–20 lb ft (20–27 N·m)
  - ❑ Speed sensor bolt — 20–23 lb ft (28–31 N·m)
  - ❑ PTO mounting bolts* (if PTO used)
  - ❑ Reverse signal switch to transmission, if so equipped
  - ❑ 48–60 lb in. (5.5–6.7 N·m)
  - ❑ Parking brake bolts to transmission — 117–140 lb ft (159–189 N·m)
  - ❑ Center bolt external filter — 75 lb in. (8.5 N·m)
- **Cooler Fluid Lines and Air Hose**
  - ❑ No Leaks
  - ❑ Connection Tightness
  - ❑ Correct Routing

* Tighten to vehicle manufacturer's recommendation

- **Throttle Position Sensor**
  - ❑ Proper Adjustment
  - ❑ Correct routing of cable and harness
- **Parking Brake**
  - ❑ Proper clearance
  - ❑ Adjustment for full application
  - ❑ Check for full release
- **Input Retarder**
  - ❑ Adjustment for full open, closed
  - ❑ Ease of operation
- **Driveline**
  - ❑ Proper indexing of universal and slip-joints
  - ❑ Proper drive shaft angles
  - ❑ Driveline backlash
  - ❑ Lubricated universals and slip-joints
- **Hydraulic System**
  - ❑ Recommended fluid
  - ❑ Proper fluid level in transmission
  - ❑ Proper calibration of the dipstick
  - ❑ Properly vented filler tube
  - ❑ Proper filler tube and oil pan connection
  - ❑ Clean and free of obstruction breather
  - ❑ Transmission fluid leak
- **Instruments and Electrical Equipment**
  - ❑ Proper wiring and electrical connections
  - ❑ Instruments, gauges, and light work correctly
  - ❑ Shift selector display is on and DO NOT SHIFT light is off
  - ❑ Fluid temperature gauge is working correctly
- **Power Takeoff**
  - ❑ Proper control connection and operation
  - ❑ Correctly coupled to driven equipment
  - ❑ Properly connected and routed lubrication line — if used

6–2. ROAD TEST AND VEHICLE OPERATION CHECKLIST

NOTE:
Refer to HT/CT Transmission Operator's Handbook for operating instructions.

a. Driveability. Drive-away checks are performed to verify proper transmission and support equipment installation and operation. The following steps outline drive-away check procedures:

- Check Fluid — fill the transmission with the appropriate fluid.
- Start the Vehicle — check for proper system response during start-up.
  - — Turn on the vehicle master/ignition switch.
  - — The DO NOT SHIFT light should come on.
  - — Start the engine.
  - — The DO NOT SHIFT light should go off.
- Clear Trouble Codes — during installation, it is common for "false" codes to be stored in the electronic control's ECU. These codes must be cleared prior to road testing the vehicle.
- Road Test the Vehicle — allow the electronic control time to "converge" shifts.
- Check for Proper Operation — check all components for proper mounting and operation, and check for transmission fluid leaks at gasket surfaces, lines, and hoses.
- Re-check for Trouble Codes — use the Pro-Link® or Diagnostic Data Reader (DDR) to determine if codes were set during the road test. Connect the Pro-Link® or DDR to the ECU through the Diagnostic Data Link (DDL).
- Troubleshoot — if codes exist after the road test, problems must be found and corrected. Refer to the latest edition of HT/CT Troubleshooting Manual TS2712EN.

b. Service and Maintenance. Refer to the latest edition of the HT 700 Series Electronic Control Service Manual for detailed transmission service and maintenance instructions. Refer to the latest edition of the HT 700 Series Electronic Control Troubleshooting Manual for detailed electronic control system troubleshooting. Refer to Section 7–2 for the latest publication number.

c. **Road Test Checklist.** Complete the following checklist.

- **Neutral Start Circuit**
  - ❑ Starts only in neutral
- **Instruments**
  - ❑ DO NOT SHIFT light and CHECK TRANS light
  - ❑ Transmission fluid pressure gauge — if used
  - ❑ Speedometer
  - ❑ Temperature gauge — if used
  - ❑ Reverse warning system — if used
- **Transmission Fluid**
  - ❑ Fluid level meet specifications — cold, neutral, level
  - ❑ No leaks
  - ❑ Warm-up and check fluid level — hot, neutral, level
- **No-Load Governed Engine Speed**
  - ❑ No-load governed speed of engine
  - ❑ Adjust governor as necessary — refer to the manufacturer's specifications for the engine-transmission being tested.
- **PTO**
  - ❑ PTO operation — refer to HT 700 Series Operator's Manual or to the vehicle manufacturer's specific instructions.
- **Shift Sequence**
  - ❑ Transmission upshifts and downshifts smoothly through all ranges
- **Other Checks**
  - ❑ Stall test
  - ❑ Shift quality
- **Comments**

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CUSTOMER SERVICE

SECTION
VII

7–1. OWNER ASSISTANCE

The satisfaction and good will of the owners of Allison transmissions are of primary concern to Allison Transmission Division (ATD), its distributors, and their dealers.

As an owner of an Allison transmission, you have service locations throughout the world that are eager to meet your parts and service needs with:

- Expert service by trained personnel
- Emergency service 24 hours a day in many areas
- Complete parts support
- Sales teams to help determine your transmission requirements
- Product information and literature

Normally, any situation that arises in connection with the sale, operation, or service of your transmission will be handled by the distributor or dealer in your area (check the telephone directory for the Allison Transmission service outlet nearest you).

Reference the Sales and Service Directory (SA2229EN) for the current listing of Allison Transmission authorized distributor and service dealers.

We recognize, however, that despite the best intentions of everyone concerned, misunderstandings may occur. To further assure your complete satisfaction, we have developed the following three-step procedure to be followed in the event a problem has not been handled satisfactorily.

Step One — Discuss the problem with a member of management from the distributorship or dealership. Frequently, complaints are the result of a breakdown in communication and can quickly be resolved by a member of management. If you have already discussed the problem with the Sales or Service Manager, contact the General Manager. All ATD dealers are associated with an ATD distributor. If the problem originates with a dealer, explain the matter to a management member of the distributorship with whom the dealer has his service agreement. The dealer will provide his ATD distributor's name, address, and telephone number on request.

Step Two — When it appears the problem cannot be resolved readily at the distributor level without additional assistance, **contact the Allison Transmission Regional Office responsible for the local distributor.** You will be assisted by a member of the Regional Service Manager's staff, depending on the nature of your problem.

For prompt assistance, please have the following information available.

- Name and location of authorized distributor or dealer
- Type and make of equipment
- Transmission model number, serial number, and assembly number (if equipped with electronic controls, also provide the ECU assembly number)
- Transmission delivery date and accumulated miles and/or hours of operation
- Nature of problem
- Chronological summary of unit's history

Step Three — If you contacted a regional office and you are still not satisfied, **present the entire matter to the Home Office by writing to the following address or calling the phone number below:**

Manager, Warranty Administration — PF9
Allison Transmission
P.O. Box 894
Indianapolis, Indiana 46206–0894
Phone: (317) 242–3538

The inclusion of all pertinent information will assist the Home Office in expediting the matter. If an additional review by the Home Office of all the facts involved indicates that some further action can be taken, the Regional Office will be advised.

When contacting the Regional or Home Office, please keep in mind that ultimately the problem will likely be resolved at the distributorship or dealership utilizing their facilities, equipment, and personnel. Therefore, it is suggested the above steps be followed in sequence when experiencing a problem.

Your purchase of an Allison Transmission product is greatly appreciated, and it is our sincere desire to assure complete satisfaction.

7–2. SERVICE LITERATURE

Additional service literature is available. This service literature provides fully illustrated instructions for the operation, maintenance, service, overhaul, and parts support of your transmission. To ensure that you get maximum performance and service life from your unit, see your dealer or distributor for the following publications. Check the telephone directory for the Allison Transmission service outlet nearest you.

Table 7–1. Service Literature

Publication	HTB 700 Series	CLT, CLBT 700 Series
Service Manual	SM2004EN SM1992EN*	SM1314EN SM1992EN*
Parts Catalog	PC1965EN	PC1993EN
Troubleshooting Manual	TS2712EN	TS2712EN
Operator's Manual	OM1957EN	OM1957EN
Technician's Guide	GN2009EN**** GN2033EN*** GN2055EN**	GN2055EN** GN2033EN***

* Electronic Control Service Manual Supplement
** Automatic Transmission Fluid
*** HT/CLBT Series Inspection/Analysis
**** HTB Series Hydraulic Output Retarder Inspection/Analysis

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